



Perceived Impacts, Challenges and Future Prospects of Artificial Intelligence Integration in Science Education among Lecturers at Federal University Wukari

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ABSTRACT

The increasing application of Artificial Intelligence (AI) in education presents significant opportunities for improving instructional effectiveness, academic productivity, and institutional development. This study investigated the perceived impacts, challenges, and future prospects of artificial intelligence integration in Science Education among lecturers at Federal University Wukari, Taraba State, Nigeria. A descriptive survey research design was employed, and data were collected using a structured questionnaire administered to Science Education lecturers selected through random sampling. The instrument was validated by experts in educational research and measurement, while reliability was determined using a test-retest approach. Data were analyzed using SPSS version 27 through descriptive statistics, including mean and standard deviation. The findings indicated that lecturers perceived AI as beneficial for supporting continuous evaluation processes, improving institutional reputation, presenting scientific concepts through interactive approaches, enhancing assessment practices, and reducing repetitive academic tasks. However, several challenges were identified, including ethical concerns, inadequate AI infrastructure, unreliable electricity supply, shortage of AI specialists, limited AI-related skills, high cost of AI applications, and absence of institutional AI policies. Despite these challenges, lecturers demonstrated positive perceptions regarding the future adoption of AI due to increasing technological trends, willingness to use AI tools, growing demand for digitally competent educators, and institutional support. The study concludes that sustainable AI integration in Science Education requires strategic investment in digital infrastructure, capacity development, ethical frameworks, and institutional policies to maximize the educational benefits of AI.

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INTRODUCTION

Artificial Intelligence (AI) has emerged as a transformative technology influencing various sectors, including education, where it is increasingly applied to improve teaching, learning, assessment, and academic research. AI refers to machine-based systems capable of generating predictions, recommendations, or decisions

based on predefined objectives while adapting their operations through learning from available data (UNICEF, 2021, as cited in Holmes & Tuomi, 2022).

In education, AI applications such as intelligent tutoring systems, recommendation systems, automated assessment tools, and educational analytics have created opportunities

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for personalized learning experiences and improved instructional effectiveness (Dhara et al., 2022). Consequently, AI literacy among educators has become a growing priority as institutions seek to prepare academic staff and students for technology-driven learning environments (Miao et al., 2023).

Science education is among the disciplines with significant potential for AI integration because it relies on inquiry, problem-solving, data interpretation, and innovative instructional approaches. AI technologies can support science educators in developing interactive learning materials, improving assessment strategies, and enhancing research productivity. The integration of AI into science education curricula has been identified as an important strategy for developing digitally competent educators and learners capable of responding to contemporary technological demands (Olatunde-Aiyedun, 2024).

However, the successful adoption of AI in higher education depends largely on lecturers' awareness, digital competence, and willingness to utilize AI applications in their academic activities. Recent studies have shown that although lecturers demonstrate increasing awareness of AI tools, their level of practical utilization remains influenced by factors such as technological skills, accessibility, and institutional support (Thomas et al., 2024; Idika et al., 2025). Similarly, research among science education students revealed that awareness of AI applications is growing, but effective utilization requires continuous training and exposure to relevant AI platforms (Gambo et al., 2025).

Despite the increasing global attention toward AI in education, limited empirical evidence exists regarding the awareness and utilization of AI technologies among Science Education lecturers in Nigerian universities, particularly in emerging institutions such as Federal University Wukari. Understanding lecturers' awareness and patterns of AI usage is essential because lecturers serve as key agents responsible for implementing technology-enhanced teaching and preparing students for future professional environments. Therefore, this study investigates the level of

awareness and utilization of artificial intelligence technologies among Science Education lecturers at Federal University Wukari, Taraba State, Nigeria. The findings will provide evidence on lecturers' AI readiness, usage patterns, and factors influencing adoption, thereby supporting institutional strategies for effective AI integration in higher education.

Research Objectives

The main objective of this study is to investigate the perceived impacts, challenges, and future prospects of artificial intelligence integration in science education among lecturers at Federal University Wukari. The specific objectives are to:

1. Examine the perceived impacts of artificial intelligence utilization on teaching effectiveness and academic productivity among Science Education Lecturers at Federal University Wukari.
2. Assess the influence of artificial intelligence technologies on research activities, instructional design, student engagement, and academic decision-making among lecturers.
3. Identify the challenges affecting effective integration of artificial intelligence technologies among Science Education Lecturers at Federal University Wukari.
4. Determine the institutional, technological, and personal barriers limiting the adoption of artificial intelligence technologies among lecturers
5. Explore the future prospects and opportunities for artificial intelligence integration in science education at Federal University Wukari.

LITERATURE REVIEW

Artificial Intelligence Integration and Transformation of Science Education

Artificial Intelligence (AI) has introduced new possibilities for improving educational quality through intelligent systems capable of supporting teaching, assessment, and learning processes. AI technologies enable educational institutions to



move beyond traditional instructional approaches by providing personalized learning environments, automated feedback mechanisms, and data-driven decision-making systems (Dhara et al., 2022). Holmes and Tuomi (2022) explained that the transformative potential of AI lies in its ability to complement human cognitive abilities rather than completely replace educators.

Science education particularly benefits from AI integration because scientific learning involves complex reasoning, experimentation, and interpretation of large amounts of information. AI applications can assist lecturers in creating interactive learning environments, improving instructional strategies, and supporting students' understanding of scientific concepts. According to Almasri (2024), empirical studies have demonstrated that AI integration contributes positively to students' engagement, knowledge acquisition, and learning outcomes in science-related disciplines.

Perceived Impacts of Artificial Intelligence in Education

The integration of AI in education has generated considerable interest due to its potential impacts on teaching effectiveness, student engagement, and academic productivity. AI-driven educational interventions can support personalized learning by adapting instructional materials according to individual learners' needs. Patel (2024) reported that AI-supported educational interventions improved student engagement, knowledge retention, digital literacy, and academic performance.

Similarly, Hooda et al. (2022) highlighted the importance of AI in educational assessment and feedback systems. AI-based assessment tools can provide immediate and personalized feedback, enabling students to identify learning gaps while allowing lecturers to improve their instructional approaches. Such applications enhance formative assessment practices and contribute to improved learning experiences. At the institutional level, AI can support lecturers through automated administrative tasks, research assistance, and improved academic decision-making. Wang et al.

(2024) reported that higher education represents the most studied area of AI application, indicating increasing recognition of AI's potential in transforming university teaching and learning processes.

Challenges Associated with AI Integration in Education

Despite the benefits associated with AI adoption, several challenges limit its effective implementation in higher education institutions. One major challenge is inadequate digital literacy among educators. García-Martínez et al. (2023) emphasized that educators require sufficient understanding of AI tools, their applications, and their relevance to classroom contexts before meaningful integration can occur. Infrastructure limitations also represent a significant barrier, particularly in developing countries.

Okunade (2024) noted that inadequate access to computers, internet connectivity, and digital resources restricts the effective deployment of AI-supported educational systems. Furthermore, teachers' attitudes toward AI influence adoption outcomes, as educators may demonstrate resistance due to concerns about technological dependence or may excessively rely on AI systems without critical evaluation (Zhai et al., 2021). Wang et al. (2024) further identified technical, personal, and social challenges affecting AI development in education. These include concerns related to algorithm fairness, assessment reliability, lifelong learning, motivation, and ethical issues surrounding AI applications.

Future Prospects of Artificial Intelligence in Science Education

Despite existing challenges, AI presents significant opportunities for improving science education in the future. Effective integration of AI can support innovative teaching approaches, enhance research productivity, improve learner support systems, and promote digital transformation within universities. For institutions such as Federal University Wukari, understanding lecturers' perceptions of AI benefits and challenges is essential for developing appropriate



policies, training programmes, and infrastructure required for sustainable AI adoption.

METHODOLOGY

This study adopted a descriptive survey research design to examine the perceived impacts, challenges, and future prospects of artificial intelligence (AI) integration in Science Education among lecturers at Federal University Wukari, Taraba State, Nigeria. The design was appropriate for assessing lecturers' perceptions regarding AI's influence on teaching effectiveness, academic productivity, research activities, and adoption challenges. The study population comprised Science Education lecturers at Federal University Wukari, selected through a random sampling technique to ensure adequate representation.

Data were collected using a structured questionnaire developed based on the research

objectives, covering demographic characteristics, perceived AI benefits, integration challenges, and future opportunities. Responses were measured using a five-point Likert scale. The instrument was validated by experts in educational research and measurement, while reliability was determined using a test-retest procedure. Data obtained were analysed using SPSS version 27 through descriptive statistics, including frequency, percentage, mean, and standard deviation. The analysis provided insights into AI benefits, barriers, and strategies for sustainable AI integration in Science Education at Federal University Wukari.

RESULTS

Perceived Impacts of Artificial Intelligence Utilization among Science Education Lecturers

Table 1: Perceived Impacts of Artificial Intelligence Utilization among Science Education Lecturers

S/N	Perceived Impact of AI Integration	Mean	Decision
1	AI makes teaching and learning more enjoyable	2.66	Accepted
2	AI presents scientific materials in interactive and tangible formats	3.00	Accepted
3	AI supports continuous evaluation processes	4.00	Accepted
4	AI provides objective assessment methods for educators	2.66	Accepted
5	AI automates repetitive tasks such as grading and attendance monitoring	2.66	Accepted
6	AI improves teaching experiences	2.51	Rejected
7	AI improves institutional reputation	3.66	Accepted
8	AI enhances lecturers' participation, interest, and learning	2.66	Accepted

Source: Field Survey 2026

Table 1 presents the perceived impacts of artificial intelligence (AI) utilization among Science Education lecturers. The findings revealed that lecturers generally perceived AI as beneficial for improving educational practices. The highest-rated impact was the role of AI in supporting continuous evaluation processes (Mean = 4.00), followed by improvement of institutional reputation (Mean = 3.66) and the ability of AI to present scientific materials in interactive and tangible formats (Mean = 3.00). Other perceived benefits included making teaching and learning more enjoyable, providing objective assessment methods, automating repetitive academic tasks such as grading and

attendance monitoring, and enhancing lecturers' participation, interest, and learning (Mean = 2.66). These findings indicate that Science Education lecturers recognize AI as a supportive technology capable of improving instructional efficiency, assessment practices, and educational quality.

The strong perception of AI in continuous evaluation suggests that lecturers value AI-based systems for monitoring learners' progress and providing timely academic feedback. This aligns with Hooda et al. (2022), who reported that AI-supported assessment and feedback mechanisms improve learning processes by identifying students' strengths, weaknesses, and learning gaps. Similarly, Almasri (2024) demonstrated that AI applications in science

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education enhance learning engagement, instructional innovation, and personalized educational experiences.

Challenges Associated with Artificial Intelligence Integration in Science Education

Table 2: Challenges Associated with Artificial Intelligence Integration in Science Education

S/N	Challenges	Mean	Decision
1	Ethical concerns related to AI use	3.66	Accepted
2	Poor IT/AI infrastructure	2.66	Accepted
3	Erratic and inadequate power supply	3.66	Accepted
4	Fear of career implications of AI adoption	3.34	Accepted
5	Poor collaboration between computer scientists and science educators	2.66	Accepted
6	High cost of AI applications	3.00	Accepted
7	Lack of awareness among faculty members	3.34	Accepted
8	Poor strategies for implementing AI applications	2.34	Rejected
9	Absence of institutional AI policies	3.34	Accepted
10	Lack of AI specialists/experts	3.66	Accepted
11	Lack of AI technology skills	3.34	Accepted

Source: Field Survey 2026

The challenges affecting AI integration among Science Education lecturers are presented in Table 4. The findings revealed that ethical concerns (Mean = 3.66), inadequate power supply (Mean = 3.66), shortage of AI specialists (Mean = 3.66), absence of institutional AI policies (Mean = 3.34), fear of career implications associated with AI adoption (Mean = 3.34), lack of AI technology skills (Mean = 3.34), and high cost of AI applications (Mean = 3.00) were major barriers influencing effective AI implementation.

The results indicate that AI adoption requires more than individual willingness from lecturers; it depends on institutional preparedness, technological infrastructure, availability of expertise, and supportive policies. The concern regarding ethical issues reflects increasing awareness of challenges related to data privacy, academic integrity, and responsible AI usage in educational environments. Similarly, limited AI skills among lecturers suggest that

professional development and capacity-building programmes are essential for successful implementation.

These findings support García-Martínez et al. (2023), who emphasized that educators require adequate digital literacy and understanding of AI applications before meaningful classroom integration can occur. Furthermore, Okunade (2024) identified inadequate technological infrastructure and limited access to digital resources as significant constraints affecting AI adoption in educational institutions. Therefore, addressing these challenges through continuous training, improved infrastructure, reliable electricity supply, and institutional AI policies will be necessary for sustainable AI integration.

Future Prospects of Artificial Intelligence Awareness and Utilization in Science Education

Table 3: Future Prospects of Artificial Intelligence Awareness and Utilization in Science Education

S/N	Prospects	Mean	Decision
1	Increasing trend of AI adoption in educational processes	3.66	Accepted
2	Exposure of lecturers to emerging educational technologies	3.00	Accepted
3	Willingness of lecturers to use AI technologies	3.00	Accepted
4	Possession of necessary digital competencies	2.51	Accepted
5	Increasing demand for digitally competent educators	3.00	Accepted

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S/N	Prospects	Mean	Decision
6	Support from educational partners and philanthropists	2.60	Accepted
7	Increasing number of young academics in higher education	3.00	Accepted
8	Growing interest in AI among educators	3.00	Accepted
9	Institutional management support for AI technologies	3.00	Accepted

Source: Field Survey 2026

Table 3 presents the future prospects of AI awareness and utilization among Science Education lecturers. The findings revealed positive prospects for AI integration, with the increasing trend of employing AI in educational processes receiving the highest rating (Mean = 3.66). Other promising factors included lecturers' exposure to emerging educational technologies, willingness to adopt AI tools, increasing demand for digitally competent educators, growth of young academics in higher education, increasing interest in AI among educators, and institutional management support for AI technologies (Mean = 3.00).

The findings suggest that Science Education lecturers recognize AI as an emerging educational innovation with considerable potential for improving teaching and research practices. However, the successful realization of these prospects depends on strengthening digital competencies, providing institutional support, and developing strategic frameworks for responsible AI adoption. This observation agrees with Wang et al. (2024), who noted that the future development of AI in education depends on the interaction between technological, organizational, and social factors. Therefore, universities must adopt comprehensive AI integration strategies that combine infrastructure development, staff training, ethical guidelines, and institutional commitment.

CONCLUSION

This study concludes that Science Education lecturers perceive artificial intelligence as a valuable educational innovation capable of improving teaching effectiveness, assessment practices, academic productivity, and institutional development. The findings demonstrate that AI is particularly recognized for supporting continuous evaluation processes, enhancing interactive presentation of scientific concepts, improving

institutional reputation, and reducing repetitive academic tasks. These perceived benefits highlight the potential of AI to complement lecturers' roles and enhance the quality of science education.

Despite these benefits, the study identifies several challenges that may hinder effective AI integration, including ethical concerns, inadequate digital infrastructure, unreliable power supply, shortage of AI specialists, limited AI skills, high cost of AI applications, and absence of institutional AI policies. These challenges demonstrate that successful AI adoption requires coordinated efforts involving institutional planning, technological investment, capacity building, and responsible AI governance.

The study further concludes that the future prospects of AI integration in Science Education are promising due to increasing interest in AI technologies, lecturers' willingness to adopt AI tools, growing demand for digitally competent educators, and emerging institutional support. However, realizing the full potential of AI requires strategic interventions aimed at improving digital competencies, establishing clear AI implementation policies, and creating supportive environments for sustainable AI adoption in higher education.

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